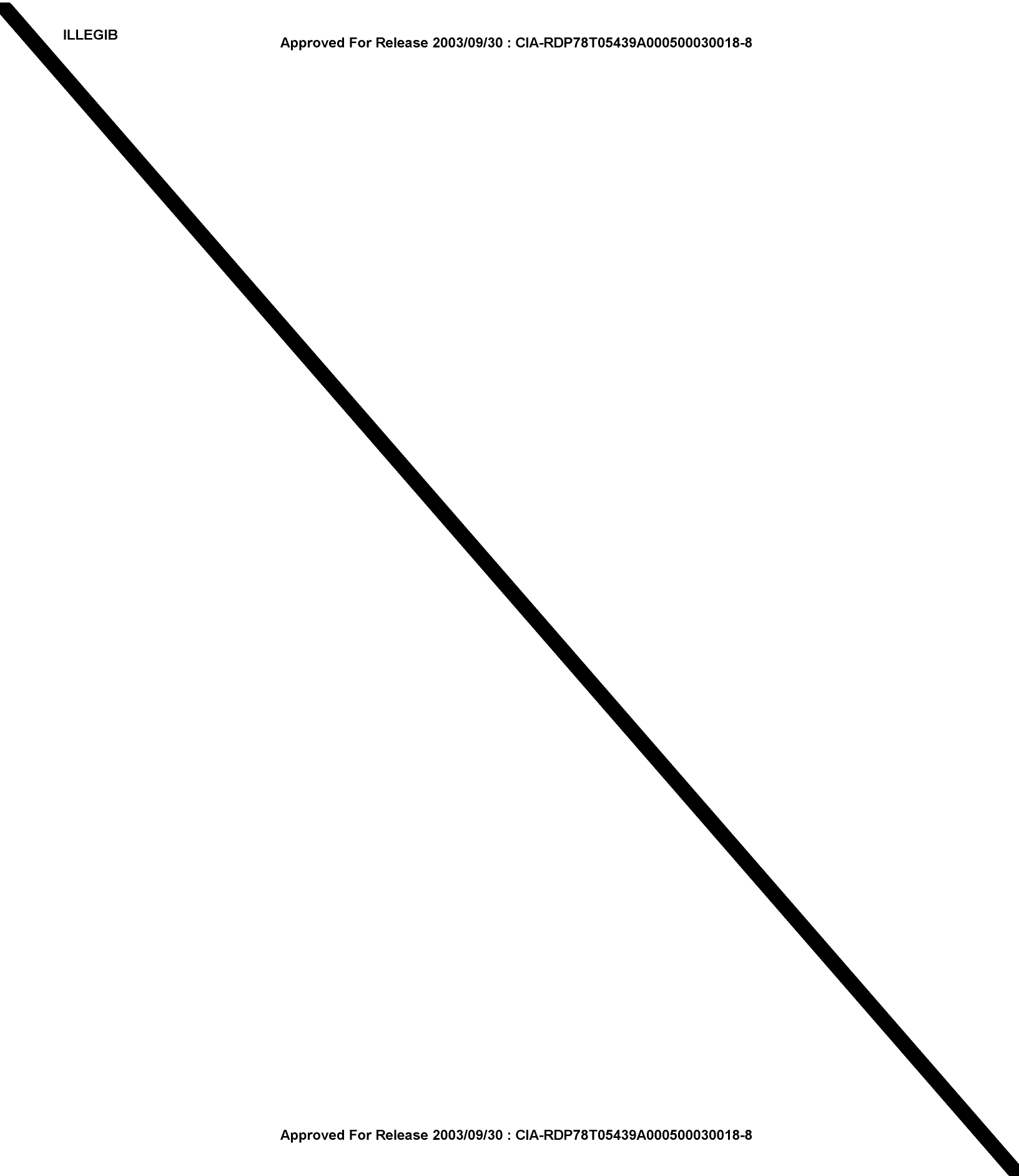

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SOVIET VOSKHOD THREE MAN SPACE FLIGHT*

25X1A [redacted]
Ballistic Missiles and Space Division
25X1A [redacted]
Life Sciences Division
and
25X1A [redacted]
Nuclear Energy Division
OSI/CIA

CONCLUSIONS AND SUMMARY

All available information indicates that the flight of Voskhod was a success. No major biomedical or spacecraft difficulties were noted.

Many of the Voskhod subsystems appear to be the same or expanded versions of those flown aboard the Vostok. Innovations were introduced however, which appear to be related to the undertaking of such future missions as rendezvous and docking or prolonged flights. Nevertheless, further technological improvements appear necessary before more sophisticated manned missions actually can be performed with this spacecraft.

The flight for the first time utilized the heavy Venik stage in a manned role, but did not use it to full capacity. The additional payload capability of the stage would allow for additional spacecraft and subsystem development on future manned space flights. Evidence is inconclusive as to whether an electric propulsion system or an ion sensor system for detecting the attitude of the ship was tested onboard the Voskhod. If an electric propulsion system were tested, it probably was an ion engine but may have been a plasma arc jet system. Other innovations included provision for the land or water recovery of the crew within the spacecraft; the choice of a higher orbit than those of the preceeding five Vostoks, thus providing an increase in orbital lifetime; the adoption of a shirtsleeve environment; and the provision of an external TV system to enhance cosmonaut visibility. [redacted]

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* Reprint of Conclusions and Summary of OSI-SR/SC/64-14, 7 December 1964, [redacted]

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LOW ALTITUDE CAPABILITY OF SOVIET AIR-TO-AIR MISSILES, ALKALI AND ATOLL

25X1A
Defensive Systems Division
OSI/CIA

Successful intercept against airborne targets by the Soviet air-to-air missiles, Atoll and Alkali, is believed to be technically possible down to "ground level," according to a recent assessment by the
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on Soviet Air Launched Missiles. The Alkali (AA-1a and AA-1b) has a radar beam-rider guidance system, and the Atoll (AA-2a), an infrared system. The use of these missiles, however, at "ground level" would be restricted by the visual tracking of targets. This tracking restriction coupled with the missiles shortened launch ranges at low altitudes would result in a significant reduction in their effectiveness when compared to launches at 10,000 feet and above.

Previous evaluation of the low altitude performance of these missiles, based primarily on the tracking capability of the fighter-radar portion of the weapon system, tended toward a lower limit of about 5,000 feet for the Alkali and about 1,500 feet for the Atoll. The lower altitude intercept by Soviet and bloc interceptors armed with these missiles, has not been observed by the West but the probability of such observations being made is low. Thus, the possession of a "ground-level" intercept capability by Soviet and bloc air forces cannot be completely ruled out.

The new low level performance assessment of the AA-1a and AA-1b is based on the use of the "fixed-beam" mode of operation by the AI radar, the SCAN CAN radar on the Farmer E and the SPIN SCAN A on the Fishpot B, respectively, which provide guidance for the missile. In this mode, the tracking antenna is fixed dead-ahead in line with the aircraft boresight line and optical sight. The guidance beam is pointed at whatever target the optical sight's reticle is aimed, thereby furnishing the beam-rider missile a guided "path" to the target. No reflected radar information is required for the fixed-beam mode of operation, thus eliminating the adverse effects usually encountered at extremely low altitudes from ground returns. This mode is especially useful when automatic tracking cannot be achieved because of electronic counter-measures or when air-to-surface attacks are made. Because target tracking in this mode is relegated to visual means, the interceptor must be pointed continually at the target during the missile flight. This greatly reduces the effectiveness of the Alkali weapon systems. A source who fired the AA-1a missile stated that while the missiles in normal operation

had a high probability of kill (above 90 percent when fired in salvo against a non-maneuvering target), the probability of kill was considerably less than 50 percent against a non-maneuvering target when the fixed-beam mode was employed.

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Recent information on the Soviet AA-2a [redacted] has confirmed the previously assumed similarities to the U.S. Sidewinder IA -- i.e. physical dimensions, type of IR detector (lead sulphide), roll stabilization technique, and even the manner in which the warhead fragment pattern is achieved. Also, the Soviets arrived at the AA-2a from the basic AA-2 in the same manner in which the United States progressed from the Sidewinder I to the Sidewinder IA, by increasing the guidance time of the missile from 11 seconds to 21 seconds. Based on a comparative analysis of these data, it is concluded that subject to the absence of extraneous IR sources and under clear air mass* conditions, the lower limit of operation for Atoll would be essentially "ground level." The attack, however, is restricted to visual tracking prior to firing. These limitations coupled with the missiles aerodynamically limited launch range of about one nautical mile at very low altitudes would greatly reduce the low altitude effectiveness of the Atoll.

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* Clear air mass is defined as the absence of clouds and precipitation between missile and target. In view of an effective launch range of one nautical mile or less, at low altitudes, the clear air mass restriction will be of lesser importance than at higher altitudes. At one nautical mile the Atoll's seeker probably will receive enough IR energy to track a target, if the pilot is able to visually track the target.

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SOVIET PHILOSOPHY CONCERNING ROLE FOR AIRCRAFT

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Defensive Systems Division
OSI/CIA

The Soviet philosophy of the increasing role of aircraft in defensive missions is discussed in an article in the February 1964 issue of Aviation and Cosmonautics, a monthly journal of the Soviet Air Force. This philosophy is supported by intelligence information.

The article acknowledges limitations in mobility of a surface-to-air missile system and indicates that the Soviets rely on an aircraft/missile weapons mix for air defense. Recent intelligence lends support to this position. The Firebar interceptor, first seen at the 1961 air show, is now appearing in numbers at operational bases. The pattern of training at these bases indicates an intercept role for Firebar at low altitudes, where the effectiveness of surface-to-air missiles decreases sharply. Missiles also are impractical for defending extensive peripheral territories. The Soviet north, the east coast and the Asiatic border area can be defended best by employing interceptor aircraft capable of barrier patrol type missions. The Fiddler, also shown in the 1961 air show, is believed to be designed for this mission, although no Fiddlers have yet been identified in operational units.

The article reflects the growing concern for the threat posed by fast carrier strike forces and missile carrying submarines which are capable of launching strikes against the Soviet Union from great distances. The Soviets clearly recognize that these forces must be engaged before they come within attack range. These ranges have increased to the extent that they now fall within the area of responsibility of the Long Range Air Force (LRA). The recognition of these mobile and submersible forces as LRA targets will require the development of new operational techniques and equipment. The most difficult problem is the development of a means of detecting submerged submerged submarines. The USSR is attempting to find a solution to this problem, but there is no evidence that adequate systems have been developed. A further possibility is the appearance of a new aircraft, either derived from an existing transport or developed specifically for the mission, with a long endurance and reconnaissance strike capability.

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